Available online at www.sciencedirect.com
SciVerse ScienceDirect
Procedia - Social and Behavioral Sciences 35 (2012) 54 – 62
Procedia
Social and Behavioral Sciences

AicE-Bs 2011 Famagusta

Asia Pacific International Conference on Environment-Behaviour Studies, Salamis Bay Conti Resort Hotel, Famagusta, North Cyprus, 7-9 December 2011

Environmental Colour Impact upon Human Behaviour: A Review

Nurlelawati Ab. Jalil[a*], Rodzyah Mohd Yunus[b] & Normahdiah S. Said[c]

[a]*Kulliyyah of Architecture & Environmental Design, International Islamic University Malaysia, Kuala Lumpur, 50728, Malaysia*
[b]*Faculty of Architecture, Planning & Surveying, Universiti Teknologi MARA, Shah Alam, 40450, Malaysia*
[c]*Faculty of Modern Languages & Communication, Universiti Putra Malaysia, Serdang, 43400, Malaysia*

Abstract

This paper analyses 40 previous colour studies selected from various disciplines discussing previous methods and colour effects in order to find its significant impact on humans. It reviews factors such as type of setting, method of assessment, instruments and type of colours. Secondly, it discuss how colours or coloured environment have influence working performances; causing certain behavior; creating negative or positive perception to surroundings and task given; and influencing moods and emotions. Finally, this paper highlights the potential scientific approach in finding colour effects on human behaviour. The paper summarized factors to be included for further steps of current investigation.

Keywords: Colour; colour effect; emotion; physiology responses; perception; human behaviour

1. Colour and its nature

In interior design, colour is seen as the easiest material to change the characteristic of the environment and dominantly visible. Despite giving character to space, colour is also useful in influencing human

* Corresponding author. Tel.: +6-03-6196-4000; fax: +6-03-6196-4864.
E-mail address: nurlelawati@iiu.edu.my.

doi:10.1016/j.sbspro.2012.02.062

behaviour, decision making, health and much more with or without our realization. In other words, colour is a subtle stimulation with salient impact has been highly affecting human lives physically, psychologically, physiologically and sociologically every day, and has now been widely accepted. Every individual see colour differently depending how one's perceived the phenomenon. According to Fehrman and Fehrman (2004), colour is people's illusion where the world is believed to be colourless. They explained that light is an important factor to colour appearance. Colour is visible to human eyes only when there is a light on the substance. It is an energy vibration of vast electromagnetic band that produce wavelengths of electromagnetic spectrum such as X-rays, gamma rays, radio frequencies, visible light, infrared rays and ultraviolet rays. Colour is only a small part of a vast electromagnetic spectrum that can be perceived by human eyes from about 400-nanometers to 700-nanometer measurement. Visible light is measure in nanometer and a nanometer is equal to 1 millionth of a millimeter. Interestingly, the energy of colour wave can also be sensed through skin (Fehrman & Fehrman, 2004; Jin *et al.*, 2005) probably used by people with visual impairment to recognize colour. In common understanding, colour is divided into cool and warm colour, where it is differentiating by characteristic of its wavelengths. Blue, green and purple are regarded as cool colour range that has shorter wavelength compared to red, orange and yellow. Red, orange and yellow are categorized as warm colours with red as the longest wavelength perceived by our eyes. Furthermore, each length has different effects to human with or without our concern.

Thereby, this paper attempts to justify theoretically the effects of colour on human well being through literature analysis ranging from various disciplines for better understanding and to embark further step of current investigation. From this the future research direction will be to study on the relationship between environmental colours and human behaviours in particular those affecting students' alertness (or) attention during learning activity.

2. Discussion of related research

Based on literature review, this paper has managed to summarize 40 researches on colour related to various perspectives dated from year 1964 to 2011 as in the table below. The review emphasis research methods and colour effects from previous findings with critical analysis and recommendation for pilot survey.

Table 1. Research summary from the review.

Author	Type of Context	Context Setting		Assessment Method					
		Actual	*Made-up*	*Environment*	*Psychology (Emotion / Mood)*	*Physiology*	*Performance*	*Non-Performance*	*Observation*
1. Aoki *et al.* (2011)	Laboratories		•		•	•	•		
2. Bynum, Epps & Kaya (2006)			•				•		
3. Elliot *et al.* (2009)			•				•	•	•
4. Green *et al.* (1982)		•					•		•
5. He *et al.* (2011)			•		•			•	
6. Isarida & Isarida (2007)			•				•		
7. Jacobs & Frank (1974)			•			•		•	

8.	Jin *et al.* (2005)			•		•	•		•	
9.	Le, Gong & Leung (2009)			•		•			•	•
10.	Nakshian (1964)			•				•		•
11.	Smeesters & Liu (2011)			•		•		•		
12.	Sumi, Tanaka & Matsuyama (2005)			•				•		•
13.	Cahilla, Turnera & Barefootb (2010)	Office / Workspace	•		•	•				•
14.	Kwallek (1996)		•		•	•			•	
15.	Kwallek & Lewis (1990)		•		•	•		•		
16.	Kwallek *et al.* (1996)		•		•	•		•		
17.	Kwallek, Soon & Lewis (2007)		•			•		•		
18.	Kwallek *et al.* (1997)		•			•		•		
19.	Küller *et al.* (2006)		•		•	•			•	
20.	Kuller *et al.* (2009)		•		•	•	•	•		
21.	Kamaruzzaman, & Zawawi (2010)		•		•	•			•	
22.	Stone & English (1998)		•		•	•		•		
23.	Stone (2003)			•	•	•		•		
24.	Manav (2007)		•		•	•			•	
25.	Tsunetsugu, Miyazaki & Sato (2005)	Living Room		•	•	•	•		•	
26.	Srivastava, & Peel (1968)	Museum	•		•				•	•
27.	Dijkstraa, Pieterseb & Pruyn (2008)	Hospital & clinic		•		•			•	
28.	Dalke *et al.* (2005)		•		•				•	•
29.	Barrick, Taylor & Correa (2002)		•			•			•	
30.	Chebat & Morrin (2007)	Shopping Mall	•		•	•			•	
31.	Yildirima *et al.* (2006)	Cafe / Restaurant	•		•				•	
32.	Helvacıoğlu & Olguntürk (2011)	Daycare / School / Carrel Room	•		•			•		•
33.	Kaya & Epps (2004)			•		•			•	
34.	Knez (2001)		•		•	•		•		
35.	Maier *et al.* (2009)		•					•		•
36.	Maier, Elliot & Lichtenfeld (2008)		•			•		•		
37.	Read (2003)		•		•				•	•
38.	Read (2010)			•	•				•	•
39.	Read & Upington (2009)			•	•				•	
40.	Stone (2001)		•		•	•		•		
TOTAL			**23**	**17**	**21**	**25**	**5**	**20**	**20**	**12**
% over 40 research studies			**58**	**43**	**53**	**63**	**13**	**50**	**50**	**30**

2.1. Review of colour research methodology

From the analysis, there are four (4) categories of variables dominantly featured by previous research studies;

- Emotion assessment
- Performance or non-performance.
- Physiology assessment
- Actual or / and made up scenario and context.

2.1.1. Emotion and environment assessment

Based on the literature review, it is found that 63% of the studies touch on subject's emotional state, second by visual environment evaluation (53%), and 35% of them included both variables with 14 empirical studies. In emotional state assessment, there are three (3) dominant instruments that have been used to assess mood state fluctuation; the Profile of Mood States (POMS) with 5 empirical studies, 3 empirical studies using Multiple Affect Adjective Check List (MAACL) with some revised version and 2 empirical studies for Positive and Negative Affect Schedule (PANAS). Besides the emotional state, subject's visual environment evaluation is stated as second highest in this review with 53%. Although only 35% of the studies or 14 empirical studies included both variables, these shows emotional states together with visual environment are worth factors to be included in colour research for a comprehensive findings even though more than half of the studies did not.

2.1.2. Performance or non-performance.

Half of the research featured non-performance with 18 of empirical studies covers the emotional and perception aspect. The remaining 50% are performance related studies which are associated with psychological test on several contexts such as learning performance, achievement task, evaluation of factor related to task, IQ test, motor task and productivity. Therefore, it shows colour research can be performance or non-performance oriented depending on its objective and feasible to be conducted.

2.1.3. Physiology assessment

Interestingly, this review has found only five (5) empirical studies include physiology assessment in their research. This also agreed by Tsunetsugu, Miyazaki & Sato (2005) and Jin *et al.* (2005) that many of previous research used psychological evaluation rather than physiological evaluation. The present review discovers a similar finding where the physiological approach in colour research is limited, probably due to accessibility and less hurdles in experimentation process in gaining the variables. Some of the evaluation points adapted have some differences as it evolved to its specific used for validity. But still, more advanced method should be counted as there are some colour effects which could not be described or identified, yet has significant impact to human's well being (Tsunetsugu *et al.*, 2005).

Theoretically, prefrontal cortex (PFC) activity is associated to mood-cognition interaction in human behaviour (Aoki *et al.*, 2011). It is a front part of brain where cognition, behaviour and emotion were functioning. In physiology investigation, human emotion changes in brain and body is measurable using several methods. For body signal, the skin conductance which known as galvanic skin responses (GSR) is use to detect the changes. While for brain assessment, electrical activity in brain (EEG) is use to see the brain wave, neuroimaging with optical topography (OT) is for seeing the hemodynamic responses (blood

circulation system) in the prefrontal cortex (PFC), or using near-infrared spectroscopy (NIRS) in measuring cerebral blood flow (rCBF) of central nervous activity.

A study by Tsunetsugu *et al.* (2005) has included both body and brain changes. In body responses, they had showed that an increase on pulse rate after being stimuli to different environment indicating a sympathetic nervous system where subject is at arousal state. In term of brain investigation, they detected an increase of rCBF in the left frontal area is assumedly indicating the subject were affected to the stimuli. Jin *et al.* (2005) in the other hand only showed body responses with decrease activity in parasympathetic nervous system from lower blood pressure, heart rate and respiratory rate after adjustment of stimuli factor caused to calming state of body and mind. Furthermore, Aoki *et al.* (2011) was also found to use only neuroimaging technique in his physiology examination.

2.2. Actual or/and made up scenario and context.

The literature review also has discovered that 58% of the research studies done in an actual setting context with mostly at offices or working area (11 empirical studies), followed with school or daycares centre (6 empirical studies) and one study at various context such as museum, clinic, hospital, cafe and shopping mall. The rest of research studies were done in a laboratory or in made up setting. Several research with made up setting or simulated are found to have unreliable findings as it did not reflect the actual situation and/or participants (Bynum *et al*., 2006; Dijkstraa *et al.*, 2008; Elliot *et al.*, 2009; He *et al*., 2011; Read, 2010; Read & Upington, 2009; Stone, 2003). Furthermore, much of previous research were also highlighted that time factor or duration of the experiment should be adequate to see its pattern (Barrick *et al.*, 2002; Dalke *et al.*, 2005; Jin *et al.*, 2005; Küller *et al.*, 2006; Kwallek *et al.*, 1990; Stone & English, 1998; Stone, 2001; Stone, 2003) as colour may has long term effects on psychological as well as physiological to human. Therefore, it appears that emotional state evaluation together with longer duration of experiment is worth to be considered for significant result.

In conclusion to this, this review has showed the significant of considering all categories in the future steps of current research and become a non-performance based investigation. This is because the conducted research will only focus on students' concentration during learning activity in their coloured room. In emotion evaluation, the Profile of Mood States (POMS) will be employed as it is used more in the research studies with five (5) empirical studies. Moreover, emotion coordinate human mind and body with interaction of perception, thought, memory, physiology, behaviour and social interaction of his situation (Pally *et al.*, 2001). Apart of that, an environment evaluation and actual environment will accommodate an actual state of the subjects for clearer understanding of what happen during the investigation. With actual setting and familiar environment, subjects are predicted to behave normally and this will contribute to accurate pattern of findings. In term of physiology assessment, the selected method will be determined based on availability of the equipment. Obviously, the brain assessment will incurred more financial investment compared to the body responses assessment.

2.3. Review of colour effects

From the analysis, much of previous studies used red for warm colour (50%) followed with blue for cool colour (35%) on its context. Therefore, colour effects of red and blue are abundantly supplied compared to other hues. Besides that, it is discovered that only one research has included subject's colour preference together with determined colour in the experimentation. With consideration of subject's colour preference, it may give significant pattern as people respond to colours differently based on culture (Fehrman & Fehrman, 2004; Chebat & Morrin, 2007). Moreover, Jin *et al.* (2005) found that colour has positive effect if the luminosity level fit the individual preference, which should be further research.

2.3.1. The white effect and screening ability

Looking at their research findings, this paper has discovered that 9 research studies highlighted the salient affects of white colour to human well being and performance (Fehrman & Fehrman, 2004; Kamaruzzaman & Zawawi, 2010; Kuller *et al.*, 2009; Kwallek, 1996; Kwallek *et al.*, 1990; Kwallek *et al.*, 1996; Kwallek *et al.*, 1997; Kwallek *et al.*, 2007; Stone, 2001). Every individual has different level of sensitivity towards environment. The ability of screening irrelevant stimuli makes high screener less arousable or less affected by the environment than the low screener (Dijkstraa *et al.*, 2008; Kwallek *et al.*, 1996). This white effect is found worsening among low screeners which caused to more error made in their performance (Kwallek *et al.*, 2007) and dysphoria or depression state (Kwallek *et al.*, 1997) than the moderate or high screeners. Besides that, it is said most public building is in white colour which is also referred as natural colour. In regards to this, many people thought white has professional quality (Stone, 2001) and widely accepted (Fehrman & Fehrman, 2004; Kamaruzzaman & Zawawi, 2010; Kwallek *et al.*, 1990; Stone, 2001) but unaware of its distinct effects on people (Kwallek *et al*., 1990; Stone, 2001). The research also suggested that more research on white should be done because many people are still unaware of its impact. This review also implies that stimulus screening ability is a relevant instrument for comprehensive findings of colour effects in future research.

2.3.2. The positive and negative effects of colours

The previous studies also show inconsistent and unclear colour effects. For example, Kwallek and Lewis (1990) found that red has the most arousal effects which has caused to less error made in certain task although it is highly rated as distracting. In contrast, Kamaruzzaman and Zawawi (2010) concluded that blue colour has the most arousal effects and has the highest rating for performing environment. Although it is said that colours are differently perceived and its meaning culturally, the method of studies should be repeated and updated for clearer understanding of colour effects.

Interestingly, colours are found to have its negative effects. Besides of arousal effect, red is found to cause avoidance behaviour when subjects perceived it as a warning cue in performance related task, drawing away attention of high task demand and moderating the perception of perceived task (Maier *et al.*, 2008; Stone, 2003; Stone & English, 1998). The negative effects were also detected on several colours such as blue (Knez, 2001; Stone, 2003), gray and beige (Dalke *et al.*, 2005) able to minimize attention or concentration. Blue is also said to have a drowsy and sleepy effect as tested by Kuller *et al.* (2009) using the electroencephalogram (EEG). In space circulation specifically related to exhibition space, lighter colour such as light beige evoke less covered area, less concentration and low in density of footstep (Srivastava & Peel, 1968) compared to darker colour space. Therefore, colour is an important element of focal information that will determine human behaviour towards its surroundings.

From this review, it is found that too many researches focus on few prominent colours such as red (53%), blue (30%), white (25%) and green (19%). The research should consider wider range of colour selection for wider perspective of colour effect that suit to its purpose. As for this research, five (5) hues will be used based on several factors. Although red effects are abundantly found, it will be included for its wavelength characteristic and arousal effect to human senses. The second colour is white as it has less documented effect, and furthermore, subjects' preferred and less preferred colours will be observed as it is said preferred colour will give positive effect (Jin *et al.*, 2005). Green hue, which is said to have calming effect and stress reducing, will also be adapted for a comprehensive investigation as future research will touch on learning in coloured environment.

3. Conclusion and suggestion for further steps of current research

The analysis of the literature shows several significant factors that should be adapted in further steps of current investigation as below;

- Actual setting with actual scenario
- Emotional state evaluation using Profile of Mood States (POMS), visual environment assessment & perception.
- Subject's preference colour, testing of white colour effect and stimuli screening ability.
- Longer duration of experiment.
- Using scientific measurement for physical responses.

The attributes above has significant effect of coloured environment in influencing student's learning activity and their well being. As a conclusion, the recommended method and factor as discussed above will be adapted in the investigation of the interior colour effects on students' alertness or attention during learning activity. The considerations of these factors are due to its important component in supporting student's self efficiency and motivation in learning process and activity. Taking students at public universities as the focus subjects and hostel room as the context, the attributes above has significant effect of coloured environment in influencing student's learning activity and their well being. By understanding individual stimulus screening ability, colour preference and less preferred, and using actual context for the experiment, this approach will reduce the research gap identified from the reviews. An appropriate colour may contribute to longer span of concentration in learning, improving performance and influence positive emotion and perception to its surrounding. With ignoring its significant, it may contribute to salient impact to student such as lower reading ability, leading to more mistakes in completing certain task, feeling sleepy and lack of concentration which affecting student's performance as a whole. Learning environment should be visually stimulating as learning itself requires motivation, mood and action from the learner. Although quite a number of studies have included performance measurement as one of the factor, the further investigation will mainly be focused on measuring the state of alertness of the subjects or attention to learning activity in the coloured environment. In doing so, the intended investigation will encompass psychological evaluation and physiological measurement to detect any unidentified responses which could not be described by evaluation method (Tsunetsugu et *al.*, 2005). With the additional method, a solid finding can be found for future reference to designers, other professionals and the local institutions themselves in designing a conducive learning environment.

References

Aoki, R., Sato, H., Katura, T., Utsugi, K., Koizumi, H., Matsuda, R., et al. (2011). Relationship of Negative Mood with Prefrontal Cortex Activity during Working Memory Tasks: An Optical Topography Study. *Neuroscience Research, In Press, Corrected Proof*. doi: 10.1016/j.neures.2011.02.011

Barrick, C. B., Taylor, D., & Correa, E. I. (2002). Color Sensitivity and Mood Disorders: Biology or Metaphor? [doi: 10.1016/S0165-0327(00)00358-X]. *Journal of Affective Disorders, 68*(1), 67-71

Bynum, C., Epps, H. H., & Kaya, N. (2006). Color Memory of University Students: Influence of Color Experience and Color Characteristic. *College Student Journal, 40*(4), 824-831

Cahilla, J., Turnera, J., & Barefootb, H. (2010). Enhancing the Student Learning Experience: The Perspective of Academic Staff. [DOI: 10.1080/00131881.2010.504063]. *Educational Research, 52*(3), 283 — 295

Chebat, J.-C., & Morrin, M. (2007). Colors and Cultures: Exploring the Effects of Mall Décor on Consumer Perceptions. [doi: 10.1016/j.jbusres.2006.11.003]. *Journal of Business Research, 60*(3), 189-196

Dalke, H., Little, J., Niemann, E., Camgoz, N., Steadman, G., Hill, S., et al. (2005). Colour and Lighting in Hospital Design. [doi: 10.1016/j.optlastec.2005.06.040]. *Optics & Laser Technology, 38*(4-6), 343-365

Dijkstraa, K., Pieterseb, M. E., & Pruyn, A. T. H. (2008). Individual Differences in Reactions towards Colour in Simulated Healthcare Environments: The Role of Stimulus Screening Ability. [doi:10.1016/j.jenvp.2008.02.007]. *Environmental Psychology, 28*, 268-277

Elliot, A. J., Maier, M. A., Binser, M. J., Friedman, R., & Pekrun, R. (2009). The Effect of Red on Avoidance Behavior in Achievement Contexts. *Personality and Social Psychology Buletin, 35*(3), 365-375

Fehrman, K. R., & Fehrman, C. (2004). *Color: The Secret Influence* (2nd ed.). Upper Saddle River, NJ: Pretice Hall

Green, W. K., Hasson, S. M., Mohammed, S. K., Phillips, C. L., Richards, P. E., Jr., M. E. S., et al. (1982). Effect of Viewing Selected Colors on the Performance of Gross and Fine Motor Tasks. *Journal of Perceptual and Motor Skills, 54*(3), 778

Helvacıoğlu, E., & Olguntürk, N. (2011). Colour Contribution to Children's Wayfinding In School Environments. [doi:10.1016/j.optlastec.2009.06.012]. *Journal of Optics & Laser Technology, 43*(1), 410-419

He, W., Zhang, Y., Zhu, J., Xu, Y., Yu, W., Chen, W., et al. (2011). Could Sex Difference in Color Preference and Its Personality Correlates Fit Into Social Theories? Let Chinese University Students Tell You. [Doi:10.1016/j.paid.2011.03.035]. *Journal Of Personality and Individual Differences*

Isarida, T., & Isarida, T. K. (2007). Environmental Context Effects of Background Color in Free Recall. *Journal of Memory and Cognition, 35*(7), 1620-1630

Jacobs, K. W., & Frank E. Humstmyer, J. (1974). Effects of Four Psychological Primary Colours on GSR, Heart Rate and Respiration Rate. *Journal of Perceptual and Motor Skills, 38*, 763 – 766

Jin, H.-R., Yu, M., Kim, D.-W., Kim, N.-G., & Chung, S.-W. (2005). Study on Psychological Responses to Color Stimulation. Focused On User Centered Design Sensibility Engineering Design of Color

Kamaruzzaman, S. N., & Zawawi, E. M. A. (2010). Influence of Employees' Perceptions of Colour Preferences on Productivity in Malaysia Office Buildings. *Journal of Sustainable Development, 3*(3), 283-293

Kaya, N., & Epps, H. H. (2004). Relationship between Color and Emotion: A Study of College Students. *Journal of College Student, 38*(3), 396-405

Knez, I. (2001). Effects of Colour of Light on Nonvisual Psychological Processes. [doi: 10.1006/jevp.2000.0198]. *Journal of Environmental Psychology, 21*(2), 201-208

Küller, R., Ballal, S., Laike, T., Mikellides, B., & Tonello, G. (2006). The Impact of Light and Colour on Psychological Mood: A Cross-Cultural Study Of Indoor Work Environments. *Ergonomics, 49*(14), 1496-1507

Kuller, R., Mikellides, B., & Janssens, J. (2009). Color, Arousal, and Performance. A Comparison of Three Experiments. *Journal of Colour Research and Application, 34*(2), 141-152. doi: 10.1002/col.20476

Kwallek, N. (1996). Office Wall Color: An Assessment of Spaciousness and Preference. *Journal of Perceptual and Motor Skills, 83*, 49 – 50

Kwallek, N., & Lewis, C. M. (1990). Effects of Environmental Colour on Males and Females: A Red or White or Green Office. [doi: 10.1016/0003-6870(90)90197-6]. *Applied Ergonomics, 21*(4), 275-278

Kwallek, N., Lewis, C. M., Lin-Hsiao, J. W. D., & Woodson, H. (1996). Effects of Nine Monochromatic Office Interior Colors on Clerical Tasks and Worker Mood. *Journal of Colour Research and Application, 21*(6), 448 – 458

Kwallek, N., Soon, K., & Lewis, C. M. (2007). Work Week Productivity, Visual Complexity, and Individual Environmental Sensitivity in Three Offices of Different Color Interiors. *Journal of Colour Research and Application, 32*(2), 130 - 143. doi: 10.1002/col.20298

Kwallek, N., Woodson, H., Lewis, C. M., & Sales, C. (1997). Impact of Three Interior Color Schemes on Worker Mood and Performance Relative to Individual Environmental Sensitivity. *Journal of Colour Research and Application, 22*(2), 121 – 132

Lee, W.-Y., Gong, S.-M., & Leung, C.-Y. (2009). *Is Color Preference Affected by Age Difference*. Paper presented at the IASDR 2009. www.iasdr2009.org

Maier, M. A., Barchfeld, P., Elliot, A. J., & Pekrun, R. (2009). Context Specificity of Implicit Preferences: The Case Of Human Preference For Red. [doi: 10.1037/a0016818]. *Emotion, 9*(5), 734-738

Maier, M. A., Elliot, A. J., & Lichtenfeld, S. (2008). Mediation of the Negative Effect of Red on Intellectual Performance. *Personality and Social Psychology Bulletin, 34*(11), 1530-1540

Manav, B. (2007). An Experimental Study on the Appraisal of the Visual Environment at Offices In Relation to Colour Temperature and Illuminance. [doi: 10.1016/j.buildenv.2005.10.022]. *Building and Environment, 42*(2), 979-983

Nakshian, J. S. (1964). The Effects of Red and Green Surroundings on Behavior. *Journal of General Psychology, 70*, 143 – 161

Pally, R., Old, D., & Solms, M. (2001). *The Mind-Brain Relationship*. London: Karnac Books.

Read, M. A. (2010). Contemplating Design: Listening to Children's Preferences about Classroom Design. [doi:10.4236/ce.2010.12012]. *Journal of Creative Education, 2010*(2), 75-80

Read, M. A. (2003). Use of Color in Child Care Environments: Application of Color for Wayfinding and Space Definition in Alabama Child Care Environments. [Article]. *Early Childhood Education Journal, 30*(4), 233

Read, M. A., & Upington, D. (2009). Young Children's Color Preferences in the Interior Environment. [DOI 10.1007/s10643-009-0311-6]. *Journal of Early Childhood Education, 36*, 491–496

Smeesters, D., & Liu, J. E. (2011). The Effect of Color (Red versus Blue) On Assimilation versus Contrast in Prime-To-Behavior Effects. [doi:10.1016/j.jesp.2011.02.010]. *Journal of Experimental Social Psychology, 47*(2011), 653–656

Stone, N. J. (2001). Designing Effective Study Environments. *Journal of Environmental Psychology, 21*(2), 179-190

Stone, N. J. (2003). Environmental View and Colour for A Simulated Telemarketing Task. [doi: 10.1016/S0272-4944(02)00107-X]. *Journal of Environmental Psychology, 23*(1), 63-78

Stone, N. J., & English, A. J. (1998). Task Type, Posters, and Workspace Color on Mood, Satisfaction, and Performance. [doi: 10.1006/jevp.1998.0084]. *Journal of Environmental Psychology, 18*(2), 175-185

Sumi, K., Tanaka, K., & Matsuyama, T. (2005). Measurement of Human Concentration with Multiple Cameras. In R. Khosla, R. J. Howlett & L. C. Jain (Eds.), *Knowledge-Based Intelligent Information and Engineering Systems* (Vol. 3684, pp. 904-904): Springer Berlin / Heidelberg

Tsunetsugu, Y., Miyazaki, Y., & Sato, H. (2005). Visual Effects of Interior Design In Actual-Size Living Rooms On Physiological Responses. [doi: 10.1016/j.buildenv.2004.11.026]. *Building and Environment, 40*(10), 1341-1346

Yildirima, K., Akalin-Baskayab, A., & Hidayetoglu, M. L. (2006). Effects of Indoor Color on Mood and Cognitive Performance. *Building and Environment, 42*, 3233–3240